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**David Yang Gao\*** (gao@vt.edu), Department of Mathematics, Virginia Tech, Blacksburg, VA 24061. *Canonical Duality Theory and Method for Solving Non-convex and Non-conservative Hamilton Systems with Applications.*

Nonconvex problems appear naturally in many applications. Due to the nonconvexity of the total potential energy of the system concerned, traditional analysis and related numerical methods for solving these problems have proven to be very difficult, or even impossible. In this talk, the speaker will present a potentially powerful canonical dual transformation method and the associated triality theory for solving a large class of nonconvex and non-conservative Hamilton systems. He will first show that by using this method, many well-known nonlinear partial differential equations can be put in a unified framework and some differential equations can be transformed into certain dual algebraic systems. Therefore, complete solutions can be obtained. The speaker will show that many semi-linear nonconvex variational problems are actually equivalent to the so-called PDAEs. The chaotic trajectories in phase space form an invariant set in dual phase space. The triality theory can be used to control the chaotic behavior of the nonconvex systems, and to identify both global minimizer and local extrema. A powerful primal-dual algorithm is suggested. Applications will be illustrated and complete solutions to certain very difficult nonconvex optimization problems will be presented. (Received September 23, 2005)